AMENDMENTS TO THE DRAWINGS

Applicants encloses figures 13A and 13B labeled "New Sheet" in compliance with 37 CFR 1.121(d). Applicant also encloses a proposed amendment to Figure 12 wherein the lead line for reference numeral 30 is changed to an arrow and the reference numeral is repositioned to point more clearly to the liquid crystal layer in the gap between the substrates 10, 20.

Attachment: New Sheet (13A, 13B; resubmitted with label)
Replacement sheet (12B)
Annotated sheet showing changes (12B)

REMARKS

In the Office Action dated October 13, 2006, claims 1 and 4-9 are pending and all stand rejected. Reconsideration is requested, at least for the reasons discussed hereinbelow.

Objection is made to the drawings. The new drawing sheet filed August 1, 2006 is resubmitted with the label "New Sheet." The drawing showing FIG. 12B has been amended to clarify that reference numeral 30 points to the liquid crystal layer in the gap between the substrates 10, 20. No new matter is added.

Objection is made to the specification. First, the examiner states that reference to Physical Review Vol. 5 does not appear to correspond to any existing article in The Physical Review. The above amendment to the specification is made to correct this matter.

Objection also is made because the term "intermediate" is used in conjunction with the term "gray". It is recognized by the examiner that the term "intermediate gray" is merely a pleonasm. The redundancy is not harmful; it merely reinforces the fact that gray is an intermediate state between black and white for liquid crystal displays. The term "intermediate" has been deleted from claim 1 as unnecessary. Applicants respectfully submit that the redundancy is not harmful in the specification and causes no confusion to one skilled in the art. It is believed that the amendment to claim 1 obviates this objection.

Claims 1 and 4-9 are rejected under 35 U.S.C. §112, second paragraph. The term "intermediate gray" has been amended to delete "intermediate" as an unnecessary redundant term.

Claims 1, 4-6 and 8 are rejected under 35 U.S.C. §102 over van den Berk (US 4,536,059). The Examiner states that:

> Van den Berk teaches . . . the liquid crystal layer has at least two different values for a first threshold voltage for transitioning the liquid crystal layer from the planar state to the focal conic state (because the electrodes 5 are provided in the grooves and extend over "second ridges" 4 onto "first ridges" 3, hence extend over regions of different

> thickness ... and consequently the electric field at two positions of different thickness are different.

Applicants strongly disagree. Van den Berk merely discloses an invention for transitioning the liquid crystal layer from the focal conic state to a homeotropic state according to the applied voltage, as mentioned, for example, an industrial field of the invention. Further, van den Berk teaches that "the planar-conic texture does not occur in an operating matrix display device' (see column 4, lines 8-12 of van den Berk), which is far different from the present invention.

Nothing in van den Berk teaches a "liquid crystal layer [that] includes at least two regions having different values of a first threshold voltage for transitioning the liquid crystal layer from the planar state to the focal conic state," as claimed herein. As noted by the Examiner, at col. 3, lines 61-65, van den Berk teaches:

> Upon applying a voltage across the electrodes the transparent planar-conic texture changes into a light-scattering focal-conic texture, as shown in FIG. 1c, at a field strength dependent on the liquid crystal used.

There is not even a hint of a suggestion in van den Berk that the "liquid crystal layer includes at least two regions having different values of a first threshold voltage for transitioning the liquid crystal layer from the planar state to the focal conic state."

Further, at col. 4, lines 11-17, van den Berk teaches:

> ... the planar-conic texture does not occur in an operating matrix display device. At a field strength $E_1<E_H<E_2$ the liquid crystal layer is in a transparent homeotropic-nematic state when the field strength is initially higher than E_2 or is in a light-scattering focal-conic state when the field strength is initially lower than E_1.

Thus, there is no teaching that the "liquid crystal layer includes at least two regions having different values of a first threshold voltage for transitioning the liquid crystal layer from the planar state to the focal conic state," as claimed herein.

Van den Berk discloses a LCD device having two supporting plates wherein the plates have ridges. The ridges divide each picture element into a number of sub-elements and the edges of each sub-element in the homeotropic-nematic texture [of the liquid crystal composition] is maintained above E_2 if a field strength between E_1 and E_2 prevails at the area of the picture element (col. 2, lines 57-61). Above a threshold value Eth of the field strength, the liquid crystal material is light scattering. Above a field strength E2, the liquid crystal layer is transparent. As a result of hysteresis, the liquid crystal changes back to light scattering below a field strength E1. At a field strength between E_1 and E_2, the liquid crystal layer is either in the transparent state or in the light-scattering state depending on whether the field strength started from a value higher than E_2 or a value lower than E_1. (Col. 1, lines 33-52)

Thus, the ridges provided by van den Berk have no effect in providing a LCD device that is capable of performing an intermediate gray level display or a multiple gray level display. In van den Berk, if the field strength for a picture element is above the between the value E_1 and the value E_2, the ridges held above E_2 prevent the surrounding liquid crystal material from growing into a transparent region. (Col. 5, lines 21-29)

This, van den Berk ***fails*** to teach or suggest that:

> in each of the plurality of pixels, a thickness d of the liquid crystal layer has at least two different values, and the liquid crystal layer includes at least two regions ***having different values of a first threshold voltage for transitioning*** the liquid crystal layer from the planar state to the focal conic state,

as claimed herein. Van den Berk discloses only one threshold voltage for the entire liquid crystal layer.

The present invention provides a liquid crystal display device that is capable of performing a multiple gray level display. Van den Berk does not even discuss or recognize the problems in providing gray scale levels. Certainly, nothing in van den Berk solves such problems, which are solved by the present invention.

The examiner states that the limitation "whereby the liquid crystal display device that is capable of performing an intermediate gray level display or a multiple gray level display" is a statement of intended use and functional language must result in a structural difference to patentably distinguish from the prior art.

It is respectfully submitted that the claim language

> in each of the plurality of pixels, a thickness d of the liquid crystal layer has at least two different values, and the liquid crystal layer includes at least two regions ***having different values of a first threshold voltage for transitioning*** the liquid crystal layer from the planar state to the focal conic state,

as claimed herein, is a structural distinction over the cited prior art. The whereby clause adds to this structural distinction by clarifying that gray levels are provided. The structure of van den Berk does not provide gray level and does not provide a "liquid crystal layer [that] includes at least two regions having different values of a first threshold voltage for transitioning the liquid crystal layer from the planar state to the focal conic state," as claimed herein.

Claim 7 is rejected under 35 U.S.C. §103(a) over van den Berk in view of Scherer (US 5,880,801). Van den Berk is discussed in detail above. Scherer ***fails*** to make up for the deficiencies in van den Berk. Schere also fails teach or suggest that in each of the plurality of pixels, a thickness d of the liquid crystal layer has at least two different values, **and the liquid crystal layer includes at least two regions** ***having different values of a first threshold voltage*** for transitioning the liquid crystal layer from the planar state to the focal conic state.

Thus, it is not seen how the present invention would have been obvious to one of ordinary skill in the art in view of any combination of van den Berk and Scherer.

In view of the discussion above, Applicants submit that the pending application is in condition for allowance. An early reconsideration and notice of allowance are earnestly solicited.

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Respectfully submitted,

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Attachments:
New Sheet (resubmitted)
Replacement Sheet

FIG. 12B